

What is Claimed is:

1. A semiconductor device comprising:
 - a semiconductor substrate;
 - a trench formed in the substrate;
 - at least one non-trench region surrounded by the trench;
 - an active region formed on the substrate over the trench for driving current as a semiconductor element;
 - a first diffusion region formed at a bottom of the trench in the active region; and
 - a second diffusion region formed in the non-trench region,wherein current is flowable between the first diffusion region and the second diffusion region,
 - wherein the trench comprises a first trench section formed in the active region, and a second trench section intersecting the first trench section to form a mesh pattern surrounding the non-trench region,
 - wherein the first diffusion region is formed at the bottom of the first and second trench sections.
2. The semiconductor device as claimed in claim 1, wherein the trench further includes at least one third trench section connected to the first and second trench sections forming the mesh pattern to divide the non-trench region into a plurality of smaller regions.
3. The semiconductor device as claimed in claim 2, further including:
 - an electrode electrically connected to the second diffusion region; and
 - a contact section electrically connected to the second diffusion region and the electrode,wherein the contact section is disposed over and contacting all of the smaller regions in the non-trench region.
4. The semiconductor device as claimed in claim 2, wherein the third trench section extends parallel to the first trench section.

5. The semiconductor device as claimed in claim 2, wherein the third trench section extends parallel to the second trench section.
6. The semiconductor device as claimed in claim 2, wherein the third trench section extends diagonally to both the first and second trench sections.
7. The semiconductor device as claimed in claim 2, wherein the third trench section comprises a combination of two or three subsections, each of which extends parallel to the first trench section, parallel to the second trench, or diagonally to both the first and second trench sections.
8. The semiconductor device as claimed in claim 2, wherein the semiconductor device is a trench lateral transistor composed of at least the semiconductor substrate, the first and second diffusion regions, the first diffusion region driving current as a transistor, a gate insulator film formed inside the trench, a first conductor formed inside the gate insulator film, a second conductor formed inside the first conductor in the active region with an interlayer insulator film interposed therebetween and electrically connected to the first diffusion region, a first electrode penetrating through the interlayer insulator film electrically connected to the second diffusion region, and a second electrode penetrating through the interlayer insulator film to electrically connect to the second conductor.
9. The semiconductor device as claimed in claim 8, wherein the third trench section extends parallel to the first trench section.
10. The semiconductor device as claimed in claim 8, wherein the third trench section extends parallel to the second trench section.
11. The semiconductor device as claimed in claim 8, wherein the third trench section extends diagonally to both the first and second trench sections.

12. The semiconductor device as claimed in claim 8, wherein the third trench section comprises a combination of two or three subsections, each of which extends parallel to the first trench section, parallel to the second trench, or diagonally to both the first and second trench sections.
13. The semiconductor device as claimed in claim 8, wherein the second diffusion region is a drain region and the first diffusion region is a source region.
14. The semiconductor device as claimed in claim 8, wherein the second diffusion region is a source region and the first diffusion region is a drain region.
15. The semiconductor device as claimed in claim 13, wherein the inside of the third trench section is filled with the first conductor with the gate insulator film interposed therebetween, and the first conductor in the third trench section and the first electrode are insulated from each other by an interlayer insulator film.
16. The semiconductor device as claimed in claim 14, wherein the inside of the third trench section is filled with the first conductor with the gate insulator film interposed therebetween, and the first conductor in the third trench section and the first electrode are insulated from each other by an interlayer insulator film.
17. The semiconductor device as claimed in claim 8, wherein an interlayer insulator film thicker than the gate insulator film is provided along a part of a side section of the first trench section.
18. The semiconductor device as claimed in claim 1, wherein a width of the second trench section is narrower than a width of the first trench section.
19. The semiconductor device as claimed in claim 1, wherein the second diffusion region is a drain region and the first diffusion region is a source region, and further including a first

conductor formed on the inside of the first and second trench sections with an insulator film interposed therebetween, and a second conductor electrically connected to the first diffusion region formed on the inside of the first conductor in the first trench section with an interlayer insulator film disposed therebetween.

20. The semiconductor device as claimed in claim 1, wherein the second diffusion region is a source region and the first diffusion region is a drain region, and further including a first conductor formed on the inside of the first and second trench sections with an insulator film interposed therebetween, and a second conductor electrically connected to the first diffusion region formed on the inside of the first conductor in the first trench section with an interlayer insulator film interposed therebetween.

21. The semiconductor device as claimed in claim 19, further including an interlayer insulator film thicker than the insulator film in each of the first trench section and the second trench section on each side section of the first trench section and on each side section or at a bottom of the second trench section.

22. The semiconductor device as claimed in claim 20, further including an interlayer insulator film thicker than the insulator film in each of the first trench section and the second trench section on each side section of the first trench section and on each side section or at a bottom of the second trench section.

23. A method of manufacturing a semiconductor device comprising a semiconductor substrate, a trench formed in the substrate, an active region formed on the substrate over the trench for driving a current as a semiconductor element, at least one non-trench region surrounded by the trench, a first diffusion region formed on the trench, and a second diffusion region formed in the non-trench region, wherein current is flowable between the first diffusion region and the second diffusion region, wherein the trench comprises a first trench section formed in the active region and a second trench section intersecting the first trench section to form a mesh pattern surrounding the non-trench region, the method comprising the steps of:

forming the first and second trench sections on the semiconductor substrate;
forming the first diffusion region on each of the bottom of the first and second trench sections;
filling the first trench and the second trench; and
forming the second diffusion region in the non-trench region.